

Remarks

Claims 1-33 are pending. With this Amendment and Response, claims 1-7, 11, 13, 14, 16, 18, 20 and 25 are amended and claims 28-33 are withdrawn. Amendments are made to remove unnecessary claim limitations, correct typographical errors and render the claims more readable. In particular the mathematical product symbol “•“ replaces the symbol “ \equiv .” The language describing the model and equations throughout the specification make clear that the product symbol was intended. No new matter is introduced with these amendments.

Reconsideration of the amended claims, in light of the remarks which follow, is respectfully requested.

I. Interview Summary.

The undersigned attorney thanks Examiner Umez Eronini for the courtesy of a telephonic interview on September 1, 2004. During that interview, the nature of the rejection was clarified, namely, it was confirmed that reference to “Li” in various locations throughout the Office Communication was made in error and that the rejection of the claims was based solely on U.S. Patent 5,240,552 to Yu et al. (“Yu”). The relevance of the cited art to the pending claims also was discussed.

II. Rejection of the claims for indefiniteness.

Claim 4 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Office Communication states that the meaning of the phrase “wherein the first polishing recipe is determined empirically” is unclear. Claim 4 no longer includes the objectionable language, thereby rendering the rejection moot.

II. Rejection of the claims over Yu et al.

Claims 1-3, and 5-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,240,552 to Yu et al. (“Yu”).

The Office Communication acknowledges that Yu fails to teach a model for wafer polishing for a plurality of regions on a wafer, but contends nonetheless that “it would have been obvious...to employ [Yu’s] method of polishing a single wafer surface as well as a plurality of regions on a wafer as claimed by applicants for the purpose of determining the endpoint detection during a semiconductor cmp process.” See, Communication of May 5, 2004, at page 6. Applicants strongly disagree.

Yu is primarily concerned with in-situ detection of film thickness and polishing rates. To the extent that Yu teaches “controlling” a polishing process, it relates to using the information obtained during the polishing process to make a decision about the process “end point,” i.e., whether to halt the polishing process or continue polishing. There is absolutely no suggestion of “providing a model for wafer polishing” in order to identify “a wafer removal rate” or “determine a target thickness profile”, as is recited in claims 1 and/or 2.

Yu also fails to teach or disclose at least the following additional features of Claims 1 and/or 2:

- Yu does not disclose a model that “defines a plurality of substantially annular regions on a wafer and identifies a wafer material removal rate for each of these regions.”
- Yu does not disclose a model that “defines a plurality of regions on a wafer and a plurality of polishing steps and identifies a wafer material removal rate in a polishing step of a polishing process for each of the regions”.

- Yu does not teach “calculating an updated polishing model based upon [a] wafer thickness profile [] and [a] model [] and updating the first polishing recipe based on the updated model to maintain a target wafer thickness profile.”

None of the above features are suggested by the in-situ end point detection method of Yu, which is silent as to and does not require or contemplate a wafer polishing model. Thus, claims 1 and 2 and those dependent thereon are patentable over Yu.

Similarly, Yu cannot teach or suggest a method of determining a model for wafer thickness profile, as recited in claim 21 and those claims dependent thereon. Specifically, Yu does not teach or suggest (a) “measuring pre-polished wafer thickness in each of a plurality of regions defined on one or more wafers”; (b) “polishing the one or more wafers, wherein polishing comprises polishing the one or more wafers in a plurality of polishing steps”; (c) “measuring the wafer material removal rate for the one or more wafers at each of the plurality of regions after each of the polishing steps of step (b)”;(d) “providing a model defining the effect of tool state on polishing effectiveness”; and (e) “recording the pre-polished and post-polished wafer thicknesses for each or the regions on a recordable medium”.

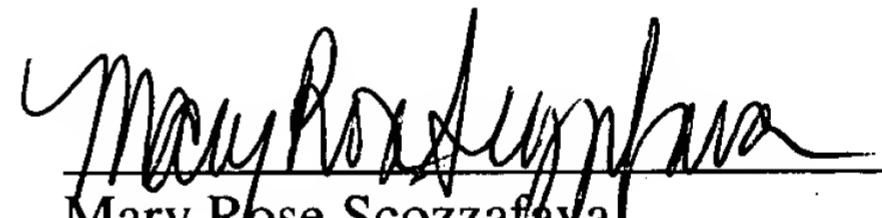
Furthermore, although each of the dependent claims is patentable by virtue of the distinguishing features of the independent claims, the dependent claims contain additional features that distinguish the claimed invention over Yu. Non-limiting distinguishing features include a model further defining “the effect of tool state on polishing effectiveness” (as recited in claim 4), a model including four or more “substantially annular regions” (as is recited in claim 6), “calculating updated polishing models for each of the plurality of polishing stations” (as recited in claim 11), and accounting “for the tool states of the individual polishing stations” in updating the model (as recited in claim 12).

For the forgoing reasons, it is submitted that the claims are not obvious in view of Yu, and it is respectfully requested that the rejection be withdrawn.

Authorization

The Commissioner is hereby authorized to charge any additional fees that may be required for this Amendment, or credit any overpayment to deposit account no. 08-0219. In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to deposit account no. 08-0219.

Respectfully submitted,



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